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TYPE I PROGRESS REPORT
REPORT NO. 2
UNIVERSITY OF TENNESSEE AGRICULTURAL REMOTE SENSING
MARCH 2, 1973

E7.8 1 0.3 1.1.

CR-130729

- (a) PROJECT TITLE: Utilization of ERTS data to detect plant diseases and nutrient deficiencies, soil types and moisture levels.

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COI - J. I. Sewell (Soil Moisture)
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- (b) GSFC ID UN650 MMC #139

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- (c) No great problems were encountered. The digital scanning micro-
densitometer was out of operation most of January and this delayed
electronic evaluation of imagery.

- (d) The reflectance characteristics of soils are conditioned by many
factors. The soil color and soil moisture content are two factors
that greatly influence soil reflectance. The medium textured soils of
the southeast generally have a reddish or yellowish hue. The reflec-
tance from these soils generally reaches a minimum at a moisture
content of 16 to 18 percent by weight (about 2 bars tension). As the
moisture content increases or decreases, the soil reflectance increases.
Maximum soil reflectance is obtained at a moisture level near or
slightly below field capacity (1/3 bar tension).

If soils are to be delineated through the use of aircraft or ERTS
imagery, the best conditions are when the soil is void of vegetation
and preferably in a freshly tilled state. This condition is generally
found only in areas of intensive row crop agriculture or areas where all
vegetation is removed from the land each year as in sections of devel-
oping countries with extremes in yearly rainfall distribution.

Another means for soil identification is where the soil is covered
with a vegetative cover characteristic to a particular soil association
or soil group. This characteristic occurs in many forested areas but
may also be found in other types of vegetative cover. In such cases
the soil associations are delineated through the reflectance character-
istics of a reasonably uniform type of vegetation possessing the same
boundaries as the soil associations. The identification of vegetation
types through reflectance characteristics is quite widely known and used.

The example reported herein is a case of soil association delineation
through the reflective characteristics of a fairly uniform cover of
vegetation. In this particular case the Memphis soil association may
be identified in Obion County using ERTS imagery. This Memphis soil

Original photography may be purchased from:
EROS Data Center
10th and Dakota Avenue
Sioux Falls, SD 57198

N73-18343
(E73-10311) UTILIZATION OF ERTS DATA TO
DETECT PLANT DISEASES AND NUTRIENT
DEFICIENCIES, SOIL TYPES AND MOISTURE
LEVELS Progress Report (Tennessee Univ.)
CSCL 02D G3/13 00311
5 p HC \$3.00
Unclas

association occurs in the western edge of the loess that covers most of West Tennessee. It is known as the "bluffs" and occurs at the break between the loess soils and the delta soils of the Mississippi floodplain.

- (e) Significant findings are shown on the attached Figures. Figure 1 shows a photograph from Channel 7, ERTS-1 imagery of 1, October, 1972 and a soil association map of Obion County. The orientation features in the photograph are Reelfoot Lake and the Mississippi River in northwest corner and the Obion River that crosses the county from northeast to the southwest. The map and picture scale is 1 inch equals about 8.5 miles.

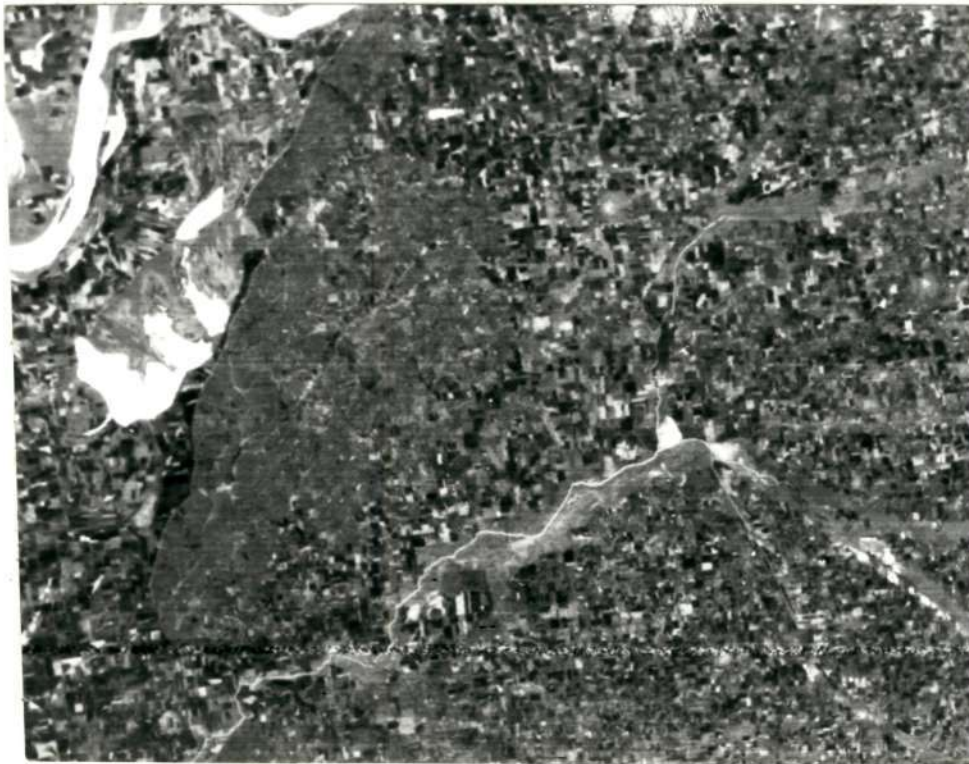
The Memphis soil association is the large block (No. 3) in the western portion of the county. A small block of the Memphis association is found in the northwest portion of the county and extends across the state line into Kentucky. The area has a fairly uniform vegetative cover of pasture grasses and this characteristic permits its delineation through ERTS-1 imagery. Small cultivation and wooded areas are found throughout the area but most of these are not of sufficient size to be detected. The areas east of the large Memphis block is one of intensive row crop agriculture.

The computer printout of the large block of the Memphis association is too large to be adequately shown in one photograph. Figure 2 shows a small portion of the computer printout that separates Reelfoot Lake, the Adler-Convent-Falaya, and the Memphis soil associations. Figure 3 shows the computer printout of the Obion River and the adjacent Waverly-Swamp association.

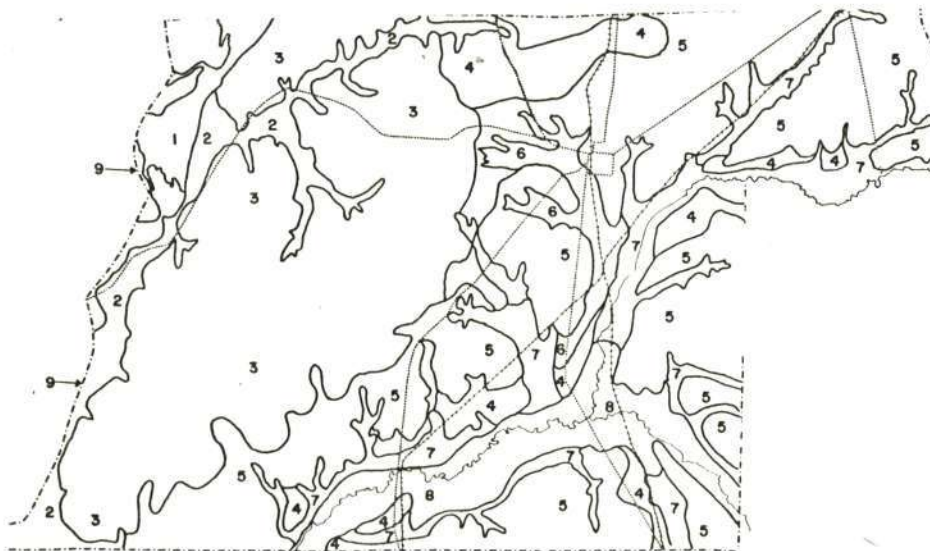
These findings demonstrate the feasibility of delineating major soils through vegetative cover characteristics common to the soils in question. Channel 7 provides the most information for studies of this type.

- (f) A paper entitled "Delineation of major soil associations using ERTS-1 imagery" is to be presented at the March 5-9 symposium on results from ERTS-1 sponsored by GSFC.
- (g) We hope that NASA aircraft support to ERTS investigators is not removed. We find the group very cooperative and the information useful.
- (h) No changes in order forms have been made.
- (i) None.
- (j) None.

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From ERTS-1, Obion County, Tennessee, 1, October, 1972



Obion County soil associations: 1. Bowdre-Sharkey, 2. Adler-Convent-Falaya, 3. Memphis, 4. Routon-Calloway-Center, 5. Grenada-Loring-Center, 6. Fountain-Dekoven, 7. Falaya-Waverly-Collins, 8. Waverly-Falaya-Swamp, 9. Iberia-Sharkey.

Figure 1. ERTS-1 imagery and soil association map of Obion County, Tennessee showing delineation of the Memphis soil association.

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.....REELFOOT LAKE.....
.....ADLER-CONVENT-FALAYA.....
.....MEMPHIS SOIL ASSOCIATION.....
.....SOIL ASSOCIATION.....
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Figure 2. Computer printout from ERTS-1 imagery evaluation separating Reelfoot Lake, the Adler-Convent-Falaya, and the Memphis soil associations.

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best available copy.

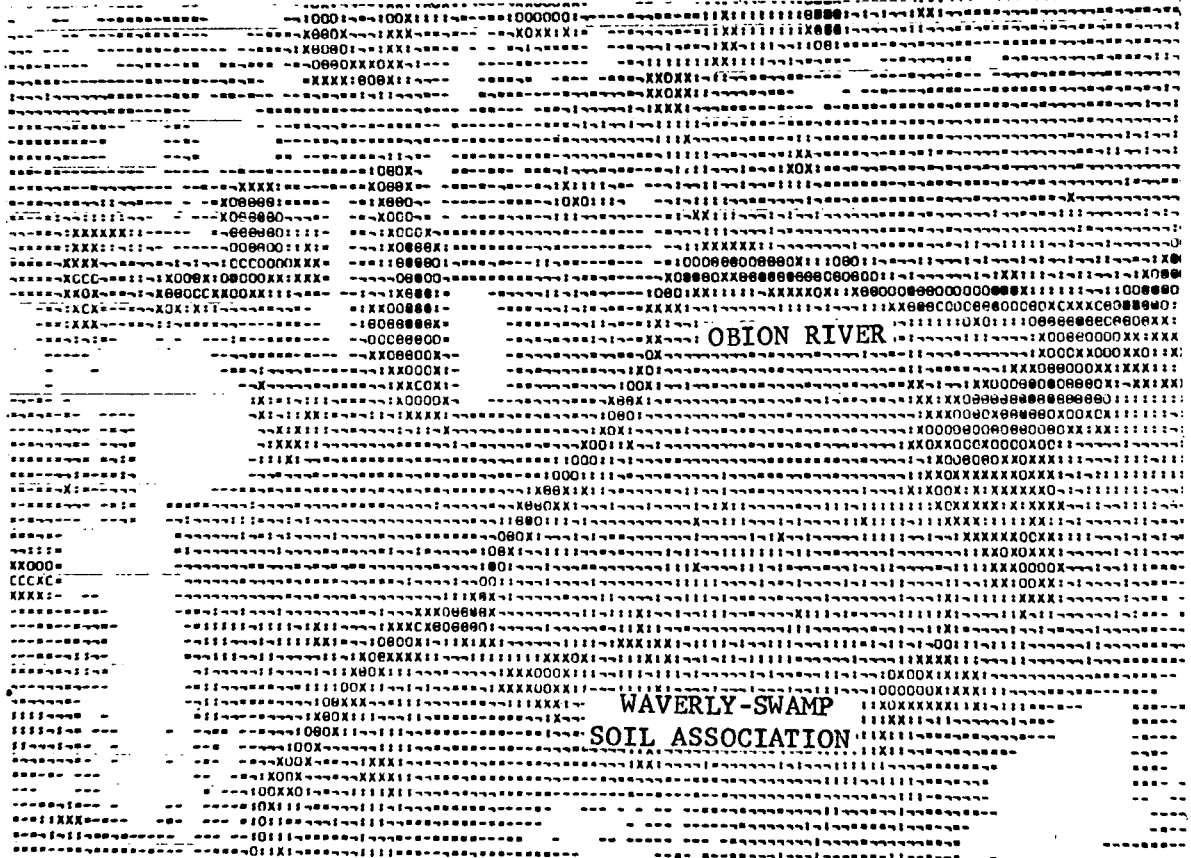


Figure 3. Computer printout from ERTS-1 imagery evaluation showing the Obion River and the adjacent Waverly-Swamp area.